Shock waves with gigabar pressure level initiated by flux of Laser-accelerated electrons [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2021.48.1.077

1Vergunova G.A., 1Gus’kov S.Yu., 2Zaretskii N.P., 3Zmitrenko N.V., 1,3Kuchugov P.A., 1Yakhin R.A.

1P.N. Lebedev Physical Institute of RAS, Moscow, Russia,   
2National Research Center Kurchatov Institute, Moscow, Russia,  
3Keldysh Institute of Applied Mathematics of RAS, Moscow, Russia, [pkuchugov@gmail.com](mailto:pkuchugov@gmail.com)

The impact of a beam of relativistic laser-accelerated fast electrons on a solid makes it possible to generate a powerful shock wave with a pressure of several gigabars [1], significantly exceeding the limiting values corresponding to the action of laser radiation directly. Thus, it becomes possible to transfer studies of the equation of state of matter in laboratory conditions to a new gigabar pressure level, which is of considerable interest for a wide range of problems.

In this work, on the basis of numerical simulation, the influence on the characteristics of the shock wave of the intensity of the incident flux of fast electrons, their spectrum and initial energy, and also the target material is investigated. The effect of strong compression of matter in the peripheral region of the shock wave to densities several times higher than the density at its front due to radiation cooling has been established.

As a result of the studies carried out, the numerically substantiated values of the laser pulse energy were established, capable of providing the generation of a shock wave with a pressure exceeding a gigabar level, the propagation of which meets the requirements of an experiment to study the equation of state of matter.

References

1. Gus’kovS., RibeyreX., TouatiM., etal., PRL, 109, 255004, 2012.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/It/ru/DB-Kuchugov.docx) [↑](#footnote-ref-1)